observations ceased. The acute attack rarely lasted through a fortnight; in a few cases which were seen early, the disease was aborted by decided treatment, and the patients were declared convalescent in the first week. Death occurred, in the fatal cases, at various times during the first two weeks. In a few cases of peculiar virulence death intervened within the first forty-eight hours.

Of 161 cases treated, 87 were cured, 43 died, and 31 remained under treatment with a fair prospect of recovery; being a little over 26 per cent. of deaths out of the whole number of cases treated.

Sequelæ and complications.—Deafness existed during and after convalescence to a greater or less extent in sixteen cases. Bed-sores occurred in four cases; they were formed by large, deep, black sloughs.

Forgetfulness of events occurring during sickness, but while the patient was apparently in full possession of his faculties, was observed in seven cases. The events forgotten were such as the visit of a mother, &c. Complete loss of memory occurred in one case only. Epistaxis occurred in twelve cases, and so profuse in two as to cause considerable exhaustion.

Purulent discharges from the ears occurred in three cases during convalescence.

Parotitis was met with in two cases; both recovered.

Carbuncles and boils were noticed as frequent sequelæ. Partial paralysis was a sequelæ in three cases.

Delirium tremens, and the effects of debauch, was a frequent complication.

The puerperal state complicated five cases.

One case originated in the insane asylum.

PHILADELPHIA, 610 S. NINTH STREET.

ART. II.—*On Luxation of the Body of the Sternum; with Remarks on the Anatomical Structure of the Superior Sternal Articulation.* By JOHN H. BRINTON, M. D., one of the Surgeons of St. Joseph's Hospital, Philadelphia; and Lecturer on Operative Surgery.

THE sternum, it will be remembered, is composed of three separate parts; the manubrium, the body or gladiolus, and the xiphoid or ensiform cartilage. These portions are connected by two articulations, which by many have been supposed to become ossified in the later periods of life. But in all probability ossific union between the manubrium and body of the sternum does not take place so frequently as is generally supposed. Béclard states that it does not occur until the sixtieth year, and often not at all. Mr. Gray, in his *Treatise on Anatomy*, remarks that this articulation is rarely obliterated, except in old age. An observation by the writer of about seventy bodies would corroborate these statements; for, although many of the sterna examined were those of persons far advanced in years, in only four or five instances was ossification of the superior sternal articulation discovered.

As might naturally be supposed, the manubrium and body of the sternum, forming as they do, in the vast majority of cases, an amphiarthrodial articulation, may at times become separated or luxated. This accident, however, if we may judge from the number of reported cases, is of exceedingly rare occurrence. So rare indeed is it, that it seems to have escaped the notice of nearly all surgical writers, or if noticed at all, to have been classed under the head of fractures. M. Maisonneuve, in a memoir read before the Academy of Medicine in Paris, in March, 1842, and published subsequently in the *Archives Générales* for July of the same year, was the first to describe the true nature, symptoms, and pathology of luxation of the body of the sternum. In his paper M. Maisonneuve reports two cases of this dislocation observed and treated by himself, and he also furnishes the details of three cases derived from other sources. The general characteristics in all of these instances were the same, namely, a dislocation of the upper portion of the body of the sternum, forward and upwards, upon the lower border of the manubrium. M. Malgaigne, in his treatise on Dislocations, reports three cases of traumatic luxation of the sternum in addition to those mentioned by M. Maisonneuve. He also submits accounts of three instances of pathological or non-traumatic displacements of the same bone. In 1863 M. E. Ancelet published in the *Gazette des Hôpitaux* an article on Luxations of the Superior Sternal Articulation, in which he presented a summary of all instances of these injuries previously reported; at the same time exhuming from the pages of one or two of the older surgical writers accounts of certain cases which, in his opinion, should be regarded as dislocations of the sternal bones, although they were ranged as fractures by the original reporters.

The above papers comprise—as far as the writer has been able to learn—all of the information we possess bearing upon the very interesting injury which forms the subject of this article.

It will be seen that the whole number of cases of luxation of the body of the sternum, both forwards and backwards, which have been reported, is but fourteen.

In view, therefore, of the rare occurrence of this accident, and of the infrequent opportunities which have been afforded for its post-mortem investigation, it seems to the writer that the notes of an additional case observed by him may not be without interest.

CASE I. Michael McAvenny, aged 23, a resident of Jaynesville, Penna., was admitted into the St. Joseph's Hospital on the 4th of October, 1859. He stated that about the 15th of August, while employed at the Black

Creek coal works, in Luzerne Co., he was caught by the flywheel, 18 feet in diameter, belonging to a 50 horse-power engine, by which he was carried once or twice around. His loss of consciousness was only momentary, and on recovering his senses he found himself under the flywheel, in the trench in which it plays. He experienced at this time no pain, but had, as he said, a dead feeling in his legs and in the lower part of his back. For a week after the accident, he suffered from retention of urine, necessitating the use of the catheter. This retention has since been followed by urinary incontinence, which exists now, as well as involuntary evacuations of his bowels. Up to the time of his being brought to St. Joseph's Hospital he had been cared for by his friends at Jaynesville, and had been under medical treatment.

On examination after his admission into hospital, I found that a complete paralysis of motion existed in both of the lower extremities, as well as an entire loss of sensation, except over the left buttock. There appeared to be some prominence and derangement of the spinous processes of the seventh and eighth dorsal vertebræ, with slight pain on pressure. A luxation of the sternum existed at the junction of the manubrium with the body of the bone, the latter being thrown forwards and upwards, and resting upon the former. The prominence of the upper end or border of the body of the bone was very marked, measuring in height perpendicularly more than one-half of an inch; the central facet for the articulation of the manubrium, as also the two lateral facets for the articulation with the inferior articulating surfaces of the second rib on each side could be distinctly detected by the finger. Both of the second ribs were apparently adherent to the manubrium. The third and fourth costal cartilages of the right side seemed to be fractured, and their sternal extremities were markedly elevated beneath the integuments. The space between the upper margin of the third and the lower margin of the second ribs on either side was much less than natural. The first and third intercostal spaces were normal. The patient stated that he had not at any time suffered much pain, nor had he experienced difficulty in breathing, save upon a very full expiration and inspiration. A large bedsore had formed on either buttock. He slept well, and his appetite and spirits were good. This patient's general health appeared to improve for a while after his entry into the hospital, under the administration of quinia, iron, and good diet; and the bedsores granulated rapidly, almost to the level of the surrounding integuments. For the first two or three weeks after admission, the temperature observed upon the inside of the thighs was somewhat elevated, averaging about one hundred and two degrees.

Nov. 15 *to Dec.* 15. During the month the lower extremities evinced a great tendency to slough; the bedsores on the buttocks re-formed, so as to expose the dorsal surfaces of the iliac bones, in spite of all precautions. Sloughs also formed on the legs posteriorly, and over the ankles to such an extent as to denude the tarsal bones; wherever the slightest pressure or tension existed, the integuments became gangrenous. Iron, quinia, malt liquors, and tonics generally were freely administered, the patient's appetite continuing tolerably good. From the 15th to the 31st of December, however, he became gradually weaker, and died from exhaustion on the 3th of January, 1860, ninety-four days after the reception of the injury.

Autopsy thirteen hours after death.—Body much emaciated; the sloughs on the buttocks broad and deep, extending to the dorsal surfaces of the iliac bones, which were denuded of periosteum. The body of the sternum was found to be luxated upwards and forwards, covering the lower and anterior portion of the manubrium to the extent of three-quarters of an inch, and firmly bound to it by fibrous tissue. The anterior ligamentous sheath was ruptured. The lateral oblique facets on the upper portion of the body of the bone were readily distinguished, and were covered with their incrusting cartilage. The central facet for the articulation of the manubrium was covered by fibrous tissue. The projection of the body of the sternum upon the manubrium measured one-half of an inch in perpendicular height. The costal cartilages of the *first* and *second* ribs were adherent to the manubrium. The *third* right costal cartilage was fractured about one-half of an inch and the *fourth* costal cartilage of the same side about one and one-quarter inches from their sternal articulations. In both cases, union by fibrous tissue had taken place with deformity, the sternal extremities of cartilages projecting under the skin. The body of the sternum was twisted somewhat obliquely downwards toward the right side. The distance between the first and second ribs was normal; whereas, between the second and third ribs it was materially decreased, measuring less than one-half of an inch, whereas it should have been at least one inch.

Examination of Posterior Surface of Sternum.—Lower border of manubrium projecting downwards. Inferior articular facets of second costal cartilages discernible, although partially covered with fibrous tissue. Posterior ligamentous sheath of sternum raised up by the projection of the lower portion of the manubrium, but unruptured. The union of the second costal cartilages to the manubrium was undisturbed. The relations of all the other ribs to the sternum were normal, as were also the attachments of the clavicle to the first bone of the sternum. The manubrium and body of the sternum were firmly bound together in their abnormal position by adventitious fibrous tissue. Anterior mediastinum natural. Thoracic viscera healthy.

Spine.—The eighth dorsal vertebra was fractured and crushed, presenting an angular displacement backwards. The axes of the vertebral column above and below the seat of fracture, formed with each other an angle of twenty degrees backward. The posterior fragment of the fractured vertebra was forced backwards so as almost to touch the posterior lamina of the vertebra, occluding the spinal canal, and completely destroying the continuity of the spinal marrow. The investing membranes of the cord were torn off anteriorly, and the posterior portion of the sheath alone was left, tightly compressed between the displaced fragment of the body of the vertebra and the fractured spinous process. The spinal marrow to the extent of two inches above, and the same distance below the seat of fracture, was softened and disintegrated. Bony union of the fragments of the body of the fractured vertebra had occurred, and a considerable amount of bony callus had been poured out on the anterior portion of the body of the bone. There was no lesion of any of the abdominal viscera.

For the purposes of comparison the following summary of thirteen additional cases of luxation forward of the body of the sternum, is presented. These are all the cases which the writer has been able to obtain access to, and, as far as he can learn, comprise all of the authenticated reported instances of this injury:—

CASE II., observed and reported by M. Maisonneuve.—Carriere, a glazier, aged 27, on the 28th of August, 1841, fell from a height of forty feet upon the floor of a church in which he was at work. He was carried to the hospital of Hôtel Dieu. Upon examination M. Maisonneuve discovered these lesions: 1, a contused wound of the scalp in the region of the left parietal boss, with denudation of the bone; 2, fracture of left clavicle; 3, an angular projection of the vertebral column, on a level with the fourth dorsal vertebra; 4, on the front of the chest, a projection forwards of the superior portion of the body of the sternum, which could be felt to rest upon the manubrium. The first and second ribs could not be detected, while all of the lower ribs were more prominent than natural, and were apparently intact, except the third of the left side, the cartilage of which appeared to be broken near its sternal articulation. There was complete paralysis of motion and sensation in the lower extremities. The patient, who had lost his intelligence at the time of the accident, regained it by the time of his arrival at the hospital. An almost constant involuntary dribling of feces continued; a bed-sore formed over the sacrum, and the patient sank from exhaustion on the 12th of October, six weeks after his entry into the hospital.

Autopsy.—1. Scalpy wound healed. 2. Fracture of clavicle united. 3. Sacrum exposed by bed-sore. 4. The spinous processes of the seventh cervical, and third and fourth dorsal vertebræ, which had been fractured at their base, were partially consolidated by fibrous callus. 5. Horizontal fracture, with crushing of the fifth dorsal vertebra; in the cavity of the vertebral canal, the membranes of the cord were intact, but the spinal marrow itself was atrophied, and softened for the space of almost three centimetres on a level with the fifth dorsal vertebra; above and below this point the marrow was healthy. 6. Sternum. The body of this bone was luxated without fracture forwards and upwards upon the inferior extremity of the manubrium, which it overlapped for about two centimetres. The cartilages of the first and second ribs preserved their normal relations to the manubrium. The cartilage of the third left rib was broken; in other respects the relations of the body of the sternum to the ribs were natural. The ligamentous fibrous sheath upon the anterior face of the sternum was ruptured, leaving the three articular facets upon the superior portion of the body of the sternum exposed to view, and covered with their cartilage. The fibrous sheath upon the posterior surface of the sternum was untorn, but was raised up by the projection of the inferior margin of the manubrium. The cartilages of the second ribs were united to their proper facet on this bone. The first and second sternal bones were strongly united in their abnormal position, so as to permit but little mobility.

CASE III., observed and reported by M. Maisonneuve.—Maupas Jean, aged 42, a tiler, fell forty-two feet upon the street pavement, and was carried, moribund, to Hôtel Dieu. He died very shortly, and on post-mortem examination the following injuries were observed: 1. A transverse fracture of sacrum. 2. Separation of both right and left sacro-iliac symphyses, and also of the pubic symphyses. 3. Fracture of twelfth dorsal vertebra, with laceration of spinal cord. 4. Luxation and fracture of wrist. 5. Luxation of the superior sternal articulation, the body of the bone being thrown forwards and upwards upon the manubrium, which it overlapped for the extent of about two centimetres; the cartilages of the first and second ribs remained attached to the manubrium, and those of the remaining ribs to the body of the sternum. The anterior ligamentous sheath was broken on a level with the luxated surfaces; the posterior sheath, on the other hand, was raised up and untorn. The three articular facets upon the superior border of the body of the bone could be felt through the integuments, and were covered by their incrusting cartilages. The ditsance between the superior border of the second sternal bone and the third ribs was normal. The cartilages of the second ribs remained attached to the first bone by their superior articular facets, while their inferior facets had separated from the body of the sternum. On the left side the cartilages of the seventh and eighth ribs were ruptured near their sternal extremity.

CASE IV., reported by MM. Maunoury and Thore, and quoted by M. Maisonneuve.—Bressaut, a laborer, was taken to Hôtel Dieu July 25th, 1841, having fallen about twelve feet upon his back; paralysis of motion and sensation in lower extremities and lower portion of trunk; priapism; retention of urine; involuntary evacuations; respiration diaphragmatic. The patient died five days after the reception of the injury, when fracture of the fifth cervical vertebra was discovered, and the brain was congested with effusion. A dislocation of the second bone of the sternum, forward upon the manubrium, was also revealed.

In addition to the above case, MM. Maunoury and Thore have extracted from Roux's clinique two instances of injury to the sternum. In the first of these a man fell twenty-five feet upon a bank, producing fracture of the fourth dorsal vertebra, paralysis, and apparently separation of the two upper bones of the sternum. Death occurred forty days after the accident from suppuration of a bed-sore over the sacrum. In the second of these cases a man fell from the fifth story, and was carried dead to Hôtel Dieu. On examination, separation of the sternal and pelvic articulations, fracture of the last cervical and first dorsal vertebræ, and luxation of the right wrist, were revealed. Both of these cases were regarded by Maunoury and Thore, as well as by Malgaigne and Maisonneuve, as fractures. M. Ancelet, however, considers them to be true luxations. The writer has not included them in his summary of sternal dislocations.

CASE V., reported by Maisonneuve, is from a specimen without history, deposited in the Musée Dupuytren by M. Thillaye, in 1820.—This specimen presents a luxation of the body of the sternum forwards, the first and second ribs remaining attached to the manubrium. In this case the patient appears to have lived for some weeks after the reception of the injury, since a partial consolidation of fractures of the left clavicle and body of the scapula of the same side had taken place.

CASE VI., reported by Auran.[1]—In this instance, a man who was mounting a ladder planted against a tree, fell with it in such a manner as to strike the upper part of the sternum against one of the rounds of the ladder. As a result of this violence, the manubrium was forced backward behind the body of the sternum. This luxation was reduced by force applied to the upper and lower portion of the trunk, and the patient was cured in twenty days.

CASE VII., presented to the Academy of Medicine in 1843, by M. Drache, and quoted by Malgaigne, who examined the case.—This patient, a young man 18 years of age, was crushed in a cellar by pieces of timber. In endeavouring to extricate himself he heard a cracking of the sternum, and the luxation was produced. The body of the sternum was thrown forwards upon the manubrium. The second rib of the right side adhered to the manubrium; the left, much less depressed, appeared to be attached to the body of the bone. All efforts at reduction failed. The principal symptom in this case was the crackling caused by the sternum on inspiration.

CASE VIII., reported by M. Malgaigne, and treated by him at the Hospital Saint Antoine.—This patient, in passing from one boat to another, fell in such a manner as to strike the upper part of the breast-bone against the sharp edge of the boat. Luxation forwards of the body of the sternum took place. When examined by M. Malgaigne, the second rib of the left side was adherent to the manubrium, whilst the second rib of the right side appeared to be situated on a more anterior plane than its fellow, and to be separated from both sternal bones. This patient experienced much difficulty in respiration. Repeated efforts at reduction proved unsuccessful. On the twenty-fifth day the patient left the hospital.

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[1] Journal de Médecine, Chirurgie, &c., 1771, t. xxxvi. p. 521, and quoted by Maisonneuve and Malgaigne.

CASE IX.,[1] reported by Duverney.—"A quarryman lay upon one side under his work. The stone, which was more than five feet long, fell upon him. The compression was so violent, as well by the weight of the stone as by the resistance of the opposite side, that the second bone of the sternum was separated from the first, and made a wound in the teguments. The wounded person died instantly. The heart and lungs were found entirely dilacerated."

CASE X.,[2] reported by M. Chevance.—This patient, while working at a ceiling, fell upon his feet from the height of one story, luxating the body of the sternum forwards, and fracturing the cartilage of the second rib of the left side. The luxation was partially reduced, and absolute rest maintained for fifteen days. A month afterwards this patient was able to resume his occupation, but the deformity remained in only a slight degree less than before the attempted reduction.

CASE XI., reported by Auran[3] and Bazille (David) in 1771.[4]—A mason fell from a height of fifty feet, striking with his back a projecting object, so that his feet were on one side, and his arms on the other side of this object. The left femur was fractured, and the spinous processes of the last dorsal and first lumbar vertebræ. The first and second bones of the sternum were separated. This patient was treated by position, and recovered from all of the injuries he had received. The account given of this case is vague, and it is difficult to decide absolutely as to the precise nature of the injury.

CASE XII., quoted by Ancelet as Nelaton's case.—A young man fell from the second story upon his feet, fracturing both legs. He experienced pain at the anterior portion of the chest, and presented an incomplete luxation backwards of the first bone of the sternum, appreciable to the touch. This patient died in three days.

CASE XIII., quoted by Ancelet.—A young man, aged 18, fell twenty feet, striking the ischium and back. Depression of two-thirds of an inch at suprasternal articulation. The luxation was reduced in twenty-four hours by placing a cushion under the back. The patient died. *Autopsy.*—Separation complete, of first and second bones of sternum. Two other fractures of sternum, as well as of sacrum, pelvis, and of first lumbar vertebra.

CASE XIV., reported and treated by M. Ancelet.—Alexis L——, a boy, aged 13, while exercising on parallel bars, his body curved forwards, and his feet almost touching the ground, suddenly came down upon his heels—without, however, losing his hold of the bars. On the following day M. Ancelet examined the patient. He found him in bed, his body curved forwards; severe pain, referred to the inferior portion of the sternum. No trace of contusion on any portion of the body. On attempting to straighten his body the pain and dyspnœa were markedly increased; prominence of the body of sternum, on which the central and left oblique facet could be felt; the right oblique facet could not be distinguished. The second rib of left side deeply seated; its fellow on right side apparently in relation with body of sternum. On placing a pillow under his back, allowing his head to hang over the edge of the bed, and making steady pressure on the anterior portion of the chest, on a level with the body of the sternum, M. Ancelet succeeded, after prolonged efforts, in reducing the dislocation. He then applied a retaining bandage. The boy was kept in bed six days, and at the expiration of three weeks was perfectly cured. In his remarks on this case, M. Ancelet inclines to the belief that this luxation was incomplete in character, and was perhaps brought about by the action of the pectoralis major muscle; that it existed without any grave concomitant lesion;

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[1] Duverney, "Diseases of the Bones." Translated by Samuel Ingham, Surgeon. London, 1762.

[2] Union Médicale, 1850, p. 6, and quoted by Malgaigne.

[3] Journal de Médecine, &c., t. xxxvi. p. 520.

[4] Prix de l'Académie de Chirurgie, t. 4, 1^{e} partie, p. 452, 1819.

and that, moreover, the reduction was obtained, maintained, and followed by a complete cure.

In the preceding pages, reference has been made to all of the reported cases of anterior luxation of the superior sternal articulation, which the writer has been able to collect. It will be seen that in twelve of the fourteen cases presented, the body of the sternum was displaced upwards and forwards, and was complete. In two instances (Cases XII. and XIV.), the luxation of the bone was in the same direction, but was partial or incomplete. But one properly authenticated case is on record of the reverse displacement, namely, that of the body of the sternum backward, or what is the same thing, a dislocation of the manubrium forwards. In this case, which is reported by M. Ancelet, the deformity arising from a backward dislocation of the second sternal bone, was detected by him in a patient eighty-one years of age, whom he was examining for other causes. The manubrium rested in front of the body of the sternum, the first rib being attached to the former, and the second rib to the latter bone. The man had fallen about forty feet, but no reliable account of the accident could be procured. M. Ancelet, also cites as veritable backward dislocations of the body of the sternum, two other cases. One of these is reported by Petit, and another by Sabatier; but from the histories given, it would seem more than probable that in both of these instances the lesion was a fracture, and not a luxation.

From an analysis of the foregoing cases of forward luxation of the superior sternal articulation, it is evident that the injury in question may be produced either by direct or indirect force. Thus in both of the cases reported by Maisonneuve, and in those of Maunoury and Thore, Duverney, Chevance, Auran and David, and myself, the luxation was caused in all probability by indirect violence. On the other hand, in M. Drache's case, in that reported by Malgaigne (Case VIII.), and in that by Auran (Case VI.), the force was directly applied. As examples of the indirect force above alluded to may be mentioned falls from a height upon the feet, or upper portion of the trunk, and also pressure exerted laterally upon the thorax. In three instances in which the sternum was displaced by direct violence, the force was received immediately over the manubrium, driving this bone backwards, and permitting the body of the sternum to ride forwards and upwards. The results of the above cases (excluding the specimen of the Musée Dupuytren) may be thus summed up: Died, seven; Recovered, six. It will be observed, however, that in no one of the fatal cases was death brought about by the lesion of the sternum alone; in six instances it resulted from fracture of the vertebral column; and in one, Duverney's case, from laceration of the lungs and heart. These facts, taken in connection with the recovery in six instances, would indicate that the prognosis, as far as mere luxation of the sternum is concerned, is not necessarily grave. As Dr. Ashhurst has observed, in speaking of injuries of the sternum[1]—"Luxation or diastasis is comparatively a slight injury, for the posterior ligament remaining intact, as was found in all the cases examined by Maisonneuve, the viscera escape laceration, and therefore, if there be not some complication which proves fatal, the patient may be expected to recover."

Symptoms.—The symptoms which have been noted in forward luxation of the body of the sternum, and which can with propriety be charged to the injury itself, are pain, dyspnœa, a crackling or creaking sound during the respiratory movements, due to the position of the bones, and deformity. The symptoms first enumerated may or may not be present in all cases, but when met with, they can readily be accounted for, if the abnormal relations of the two upper sternal bones are borne in mind. The latter symptom, the deformity, is perhaps pathognomonic. A deformity somewhat simulating this may exist in fracture, but yet it differs from it in certain essential characteristics. In luxation, the tumour or projection on the front of the chest which is caused by the overriding of the upper extremity of the body of the sternum upon the manubrium, varies of course in size according as the sternum is poorly or well developed—usually this projection is from one and three-quarters to two inches in breadth, and one half of an inch in perpendicular height. Its bony outline can easily be followed by the fingers, and the three articular facets, upon the upper portion of the gladiolus may be readily detected. Three facets as we will show hereafter, and as was first clearly pointed out by Maisonneuve, articulate normally; the central one with the lower end of the manubrium, and the two lateral ones with the inferior oblique facets of the costal cartilages of the second ribs. That these facets can be recognized even at a late period after the occurrence of the displacement, is proved by the case reported by the writer, in which these articular surfaces were clearly traceable at all times during the patient's ninety-four days of life.

Another series of symptoms usually met with in dislocation upwards of the body of the sternum, are those which depend upon the relations of the costal cartilages to the sternal bones. In the majority of cases reported, the cartilages of the two upper ribs are stated to have remained adherent to the manubrium, and to have been depressed or carried backwards with this bone. The cartilages of the third, fourth, fifth, sixth, and seventh ribs, on the other hand, remained attached to the body of the sternum, and accompanying this bone forwards presented an abnormally prominent appearance beneath the integuments. It has also usually happened that one or more of the last-named cartilages have been ruptured or fractured near to their sternal articulations. Thus, in four of the cases referred to in this paper (Cases I., II., III., and V.), the second ribs present their attachment to the manubrium; in one (Case VIII.), the second left rib adhered to the manubrium whilst its fellow on the right side appeared, as M. Malgaigne states, to have lost its attachments to both bones of the sternum. In one case (Case VII.), the same reporter observes that the second rib of the right side adhered to the manubrium, while that of the left side remained attached to the body of the sternum. In the case of the child described by M. Ancelet, the relations of the second could not be accurately ascertained. Another symptom of dislocation of the sternum is the diminished breadth of the second intercostal space. This must necessarily be the case if the third ribs, preserving their attachments to the body of the sternum, are carried upwards.

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[1] Fracture of the Sternum, Am. Journ. Med. Sciences, Oct. 1862, p. 409.

In the foregoing remarks, the writer has refrained from touching upon those grave symptoms, dependent upon fracture of the spine, or injuries to viscera which often coexist with, although not referable to, luxation of the breast bone. From what has already been set forth, it will be seen that in the majority of instances of sternal luxation of which we possess authentic post-mortem observations, the cartilages of the second ribs have remained adherent to the manubrium, and not to the body of the bone. This fact appeared to the writer to be so significant, as to lead him to search for an anatomical explanation of this peculiarity. He accordingly, some years since, made a series of examinations upon the cadaver, with the view of ascertaining the exact nature of the articulation between the manubrium, the gladiolus, and the cartilages of the second ribs. The result of his investigations coincided in the main with the conclusions arrived at previously by Maisonneuve. As an accurate account of the anatomy of this articulation is not to the writer's knowledge to be found in any of the treatises on anatomy in the English language, the following observations are offered.

Anatomy of the Superior Sternal Articulation.—Prior to the appearance of M. Maisonneuve's paper, the structure of the articulation existing between the first and second sternal bones had been overlooked, or at all events had been imperfectly described. In general terms the articulation was considered as somewhat analogous to that which exists between the bodies of the vertebræ; and ossification of the connecting fibro-cartilage was supposed to occur generally in advanced life. It is probable, however, as has been already stated, that this ossification is of comparatively rare occurrence. According to the researches of Maisonneuve, the superior sternal articulation stands upon the limit of amphiarthrodial and diarthrodial joints. Its movements are obscure, yet real, and it is consequently susceptible of a true luxation. M. Maisonneuve states, that while in a certain number of cases, about two in five, the two upper pieces of the sternum are united by an interarticular fibro-cartilage analogous to the intervertebral; in the greater number of instances the articular surfaces of the first and second sternal bones are covered with a distinct incrusting or diarthrodial cartilage. Upon the second bone of the sternum this cartilage is continuous with the oblique facet for the articulation of the cartilage of the second rib. Upon the lower end of the manubrium the incrusting cartilage is continuous by a spur of fibrous tissue with the angle of the cartilage of the second rib; this latter is received into the notch formed by the manubrium above, and by the body of the sternum below. It results from these dispositions that the chondro-sternal articulation of the upper sternal bone is isolated from the sternal articulation properly so called. Also, that the cartilage of the second rib is much more strongly attached to the first than to the second sternal bone. Hence it is that in luxations of the body of the sternum forward the cartilage of the second rib remains adherent to the manubrium, and deserts the gladiolus.

Fibrous Sheaths.—The component portions of the breast bone are held together *anteriorly,* by a firm ligamentous sheath, composed of fibres of white tissue which cross each other in every direction, and are closely adherent to the surfaces of the bones and cartilages. The *posterior* sheath is composed chiefly of longitudinal bands of white fibrous tissue, which are but slightly adherent to the bones and chondro-sternal articulations. In luxation forward the anterior sheath is ruptured while the posterior is simply raised up and stripped from the bone for a short distance.

The following statement embodies the results of the examination by the writer of thirty sterna. More than forty additional specimens were also collected and studied by him, but the records of these last observations were mislaid, and the specimens themselves destroyed, during the writer's service in the army. But the general facts herewith presented held good in these instances also.

Tabular Statement showing in thirty instances the Nature of the Articulation between the Manubrium and Body of the Sternum; and that between the Sternum and Cartilages of the Second Ribs.

The sterna examined were those of—		
Adult males	19	
Adult females	8	
Newborn infants	3	
		—Total 30
Character of articulation between manubrium and body of sternum—		
Mobile, and elastic, in	27	
Firmly ossified; no movement, in	3	
		—Total 30
Structure of articulation between manubrium and body of sternum—		
One central synovial sac between first and second sternal bones	18	
Two synovial sacs separated by fibrous tissue between same	1	
One central synovial sac prolonged over two inferior chondro-sternal facets for second ribs	1	
Union by fibro-cartilage; no synovial sac	7	
Bony union complete	3	
		—Total 30

Mode of attachments of second costal cartilage to the manubrium—		
Spur of ligamentous tissue binding the second costal cartilage to the cartilage covering lower central facet of manubrium	27	
Vestiges of same, ossification of superior sternal articulation having taken place	2	
Cartilage of second rib bound by fibrous tissue to first and second sternal bones, at all points of juxtaposition	1	
	—	Total 30
Nature of superior chondro-sternal articulation of second rib—		
Synovial sac, between superior facet of cartilage of second rib and manubrium	17	
Indistinct vestiges of same	5	
None; cartilages of second ribs attached to manubrium by fibro-cartilage	8	
	—	Total 30
Nature of inferior chondro-sternal articulation of second rib—		
Synovial sac between inferior facet of cartilage of second rib, and body of sternum.	28	
Vestiges of same	1	
Complete ossification of articulation	1	
	—	Total 30

From an examination of the foregoing statement it will be seen, that the proportion of instances in which fibrous union of the superior sternal articulation was found to exist by the writer, is rather less than that stated by Maisonneuve. The latter estimates its occurrence at about forty per cent., while, according to the writer's experience, it was met with in rather less than twenty-five per cent. of the whole number of sterna examined by him. On the other hand, the ratio of cases in which this joint was found to be provided with two articular cartilages, and an intervening synovial sac was proportionately increased. In only three cases out of the thirty did complete ossification exist, and in these instances the sterna were taken from the bodies of very old individuals. In many other sterna of advanced life, the normal characteristics of a mobile joint were preserved. It therefore seems to the writer probable that ossification of the superior sternal articulation, even in advanced life, is the exception, not the rule.

The presence of the fibro-catilaginous spur, which attaches the projecting angle of the second rib to the lower border of the manubrium is a noticeable fact. It was found to exist in a strongly marked degree in twenty-seven of the instances included in the table; and to a less marked degree in two others. In only one specimen was this ligament wanting, and in that one the cartilage of the rib was bound firmly by anterior and posterior ligaments to both the manubrium and gladiolus. In the table a comparison is offered as to the relative frequency of occurrence of synovial sacs between the upper facet of the costal cartilage and the manubrium; and the lower facet of the same cartilage and the body of the sternum. It will be seen that the synovial sac and double cartilage exists much more frequently in the latter articulation. In the former the synovial sac, when it does exist, is comparatively small in size, and often indistinct. From all of these considerations it would seem that the cartilage of the second rib is much more firmly attached to the manubrium than to the body of the sternum; and that this anatomical peculiarity explains the clinical fact, that, in the luxation forwards of the body of the sternum, the second rib remains adherent to the first, and parts from the second sternal bone.

ART. III.—*Solvents for Cholesterine, &c. &c.* By T. H. BUCKLER, M. D., of Baltimore.

IT is believed that chloroform (terchloride of formyl) and succinate of the peroxide of iron will be found superior to any other agents as solvents for cholesterine and cholesteric fat, whether in or out of the living body. Chloroform taken into the stomach for the solution of gall-stones contained in the gall-bladder, and the continued use of succinate of iron to control the fatty or cholesteric diathesis and thereby prevent the formation of other calculi, have been invariably found by the writer trustworthy and successful after an experience of twenty years.

Turpentine and ether combined, as recommended by Durande, of Dijon, are the agents generally used as solvents of gall-stones. In regard to these remedies, we have only to say that a mass of cholesterine immersed in turpentine for three weeks had undergone no sensible loss of weight at the end of that time, and that however soluble this substance may be in ether, chloroform must always be found preferable, since it not only acts as the most rapid solvent, but at the same time produces the anæsthesia so necessary for the relief of the anguish invariably attendant on an acute attack of biliary colic.

In 1848 a mass of cholesterine of the size and shape of an ordinary sized hen's egg was taken from the gall-bladder of a woman who died at the Baltimore Almshouse of some other affection. It was readily separated by gentle traction with the fingers into seventy-five irregularly quadrangular bodies about the size of an ordinary garden pea when dried. These were subjected, in separate vials, to every agent deemed capable of exerting on them a solvent influence. The masses immersed in the various acids, nitro-muriatic amongst others, had undergone no sensible loss of weight at the end of several weeks. Finally a mass, weighing several grains, immersed in Edinburgh chloroform, underwent solution in a few minutes, leaving only a friable refuse resembling the cinder of burned paper.

Not long afterwards we were consulted in the case of a married lady, aged 38, the mother of five children. She was stout and strong, and had